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PRODUCT TEST REPORT  
WATKINS ZENITH BRACKET

Prepared For:



RP Watkins LLC  
5516 West Memorial Road,  
Oklahoma City, OK 73142

Attention: Mr. Michael Summers

Project Number: FC09744.001-470

Report Number: 1617B (Rev. 1)

October 27, 2021



Product Test Report  
 Pullout Resistance Tension Testing  
 Watkins Zenith Bracket  
 CTL|T Project Number: FC09744.001-470

Per our agreement, product capacity testing was completed on the RP Watkins supplied Zenith brackets precast in ICF concrete walls. At your request, the Zenith Brackets were tested in direct tension to determine pullout resistance. These tests were conducted in general accordance with ASTM D7147 (Standard Specification for Testing and Establishing Allowable Loads of Joist Hangers), with the deviations from the standard procedure listed below.

Test sample ICF sections were constructed by the client and shipped to our laboratory for testing. The concrete mix was reported to be a 2,500-psi design strength mix (Mix Number: RMT258N3). Actual concrete strength was unknown at the time of testing.

Products and testing included in this testing program include the following:

Manufacturer Identification	Test Type
Zenith Bracket	Pullout Resistance Test*

\*The pullout resistance test was performed on single precast specimens pulled in direct tension.

We appreciate the opportunity to work with you on this project. If you have any questions regarding the information provided in this report, please do not hesitate to contact us.

Sincerely,  
 CTL|THOMPSON, INC.



Ryan S. Beck, P.E.  
 Associate Engineer  
 Accredited Laboratory Manager

Report Authorized for Release:

Revision Log

Date	Revision No.	Explanation	By
10.26.2021	0	Initial Issue	R. Beck, Manager
10.27.2021	1	Updated Shop Drawings	R. Beck, Manager



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# **SECTION 1:**

## **GENERAL OVERVIEW**

## Product Descriptions

All products listed are for use in ICF (insulated concrete form) construction. Prior to concrete placement of an ICF wall, the hanger/bracket is either inserted through the insulation (foam form) or placed at the top of the wall. Reinforcing bars are added within the ICF wall section to secure the hanger/bracket in place. Concrete is then placed to complete the ICF section. See Shop Drawings for additional details.

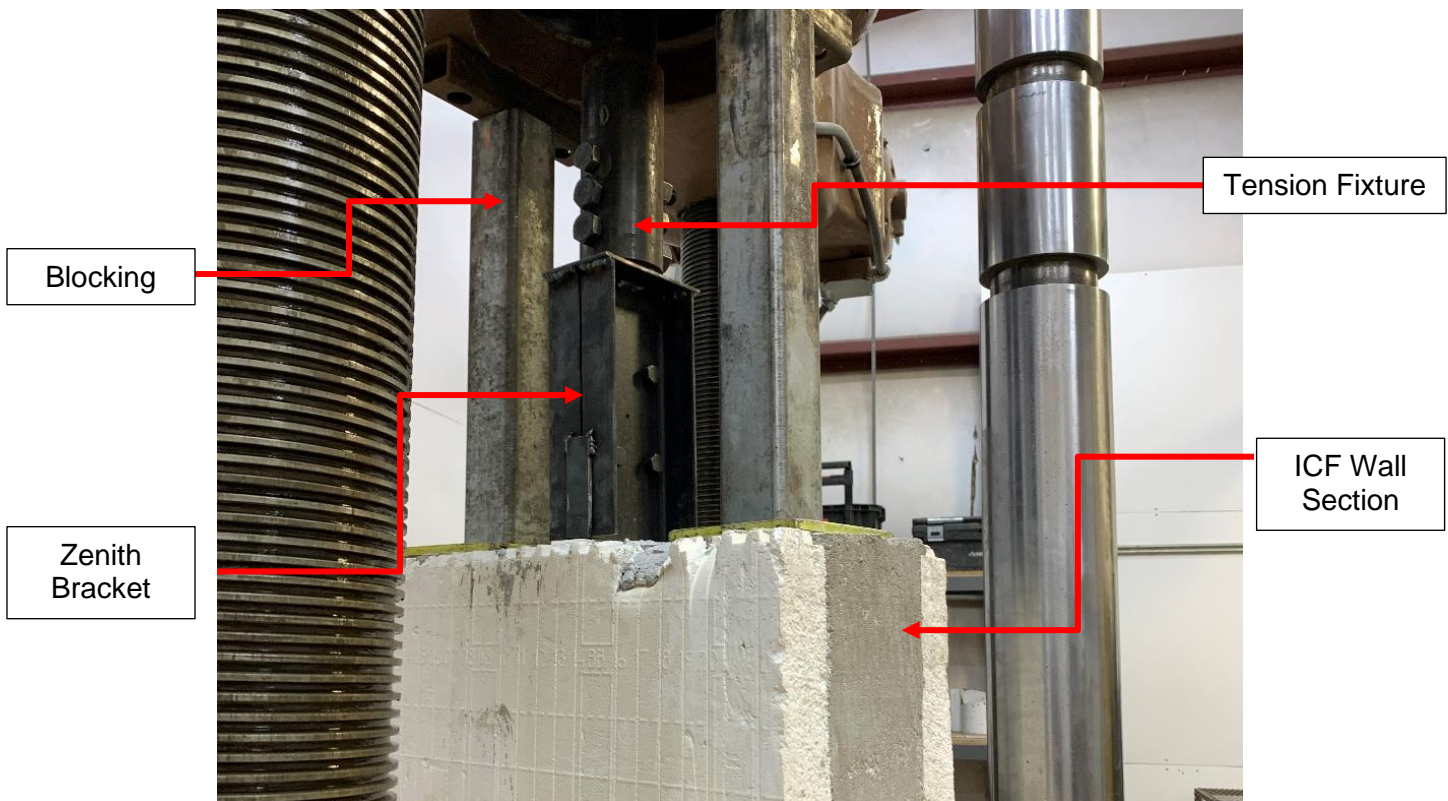
### Zenith Bracket

The Zenith Bracket is a single piece of cold-formed steel that is used to connect wood roof members (rafters) to the ICF wall section. The Zenith Bracket is set to the specified depth based on the roof pitch and can be used with or without a top plate. Wood members are fastened to the bracket by nails or lag bolts through the predrilled holes in the bracket.

## Test Sample Descriptions

### Pullout Resistance Test

The pullout tension tests, requested by the client, were performed on a single Zenith Bracket in direct tension. Each test sample consisted of one ICF wall section (20" x 24" x 9" thick), with a precast bracket installed. Specialized fixturing was created for the bracket. See Figure 1 below for test setup, tested for pullout resistance (tension). Blocking was used to resist the tension loading from the ICF wall section to the stationary crosshead, allowing the force to be applied directly to the hangers and brackets.



**Figure 1. Pullout Resistance Test – Zenith Bracket**

## **Testing Procedure Descriptions**

The tests were conducted using a calibrated universal testing machine. Samples were tested per client's instructions and in general accordance with procedures outlined in ASTM D7147. A preload of 200 – 500 lbf was applied prior to testing. Testing was terminated when concrete failure, hanger/bracket pullout or failure occurred.

### **Pullout Resistance Test**

For testing, a constant load was applied at a rate of 0.2 inches per minute. Fixtures were connected directly to the hanger/bracket. The Zenith Bracket, four (4) 3/8" x 3" Gr. 8 bolts were used to connect the fixture to the bracket. Loading was applied directly to the bracket.

### **Deviations from Standard Procedure**

The testing requirements and procedures presented in ASTM D7147 were followed where possible. Deviations from the ASTM procedure include:

- Pullout resistance tension testing is not represented in the ASTM. The load rate and general failure criteria of the samples was used to maintain consistent reporting for the hangers and brackets.
- Determination of yield and ultimate loads were modified as the very strict requirements of the ASTM standard apply to vertical deflections and do not apply properly direct pullout resistance. Determination of these points is described below.
- Readings were taken from the machine rather than directly from the sample due to spacing limitations for the Pullout Resistance Testing.

### **Determination of Test Results**

#### **Pullout Resistance Test (Table 1)**

The capacity selection criteria in ASTM 7147 are intended for vertical load arrangements involving two (2) hangers/brackets and is not well suited for direct tension applications on individual hangers and brackets. Therefore, an allowable load for each sample is reported. The allowable load is based on general engineering practice. The allowable load is reported as the lowest value between the yield load and ultimate load. Determination of these loads are described below.

**Yield Load,  $P_y$ :** For this testing arrangement, the yield load shown is approximately when the load-deflection curve no longer linear, and the system had reached a state of plastic deformation, or the system began to fail. Several samples did not exhibit a well-defined yield curve; therefore, the allowable load was based on the maximum test load recorded.

**Ultimate Load,  $P_u$ :** In general, the ultimate load applied is the maximum recorded test load for test samples. The maximum recorded test load was achieved when failure within the system occurred.



## Summary of Test Results

Table 1. Summary of Test Results – Zenith Bracket

Sample	Yield Load $P_y$ (lbs) <sup>1</sup>	Ultimate Load $P_u$ (lbs) <sup>2</sup>	Allowable Load (lbs) <sup>3</sup>	Deviation from Mean (%)	Average Allowable Load (lbs)	Failure Mode
T1	N.A.	30,747	15,374	-32.10%	<b>22,642</b>	Concrete Failure
T2	40,141	46,757	23,379	+3.26%		Concrete Failure
T3	N.A.	58,345	29,173	+28.85%		Concrete Failure

<sup>1</sup> Yield Load is approximately when the load-deflection curve is no longer linear.

<sup>2</sup> Ultimate Test Load is the maximum recorded test load

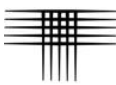
<sup>3</sup> The Allowable Load is the lesser value of  $0.6P_y$  or  $0.5P_u$

## **SECTION 2:**

# **PULLOUT RESISTANCE TEST DATA**



# ZENITH BRACKET

	<b>ACCREDITED TESTING GROUP REPORT</b> CTL Thompson, Inc. – Fort Collins		Issue Date: <b>10.27.2021</b>	Rev: <b>0</b>
	Title: <b>PULLOUT RESISTANCE TEST</b>		Report No. <b>1617B</b>	Page #: <b>1 of 4</b>

<b>Client:</b>	RP Watkins LLC
<b>Job Number:</b>	FC09744.001
<b>Product:</b>	Zenith Bracket

## Reference Method

Tests were conducted according to client's instructions and in general accordance with ASTM D7147.

## Deviations from Standard Procedure

Test samples were arranged and connected per client's instructions. Products were pulled in direct tension. Yield and ultimate loads were assessed based on general engineering practice.

## Standard Procedure

The Zenith Bracket is a single piece of cold-formed steel that is used to connect wood roof members (rafters) to the ICF wall section. The Zenith Bracket is set to the specified depth based on the roof pitch (8:12) and can be used with or without a top plate. Wood members are fastened to the bracket by nails or lag bolts through the predrilled holes in the bracket. Product dimensions were verified to design drawings for all specimens. Both applied load and deflection were recorded. Load was applied at a uniform rate of 0.2 inches per minute. Testing was terminated concrete failure, bracket pullout or bracket failure occurred.

## Summary of Results

Sample	Yield Load $P_y$ (lbs) <sup>1</sup>	Ultimate Load $P_u$ (lbs) <sup>2</sup>	Allowable Load (lbs) <sup>3</sup>	Deviation from Mean (%)	Average Allowable Load (lbs)	Failure Mode
T1	N.A.	30,747	15,374	-32.10%	<b>22,642</b>	Concrete Failure
T2	40,141	46,757	23,379	+3.26%		Concrete Failure
T3	N.A.	58,345	29,173	+28.85%		Concrete Failure

<sup>1</sup> Yield Load is approximately when the load-deflection curve is no longer linear.

<sup>2</sup> Ultimate Test Load is the maximum recorded test load

<sup>3</sup> The Allowable Load is the lesser value of  $0.6P_y$  or  $0.5P_u$

# **APPENDIX A:**

# **SHOP DRAWINGS**

# ICF Hanger Pullout Tension Test



Client: RP Watkins, LLC  
 Job Number : FC09744.001  
 Date Tested : 10.14.2021  
 Technician: Ryan Beck

Load Device: UTM 400K  
 Load Frame ID: 2563114  
 Calibration Date: 05.26.2021

## Specimen Specification

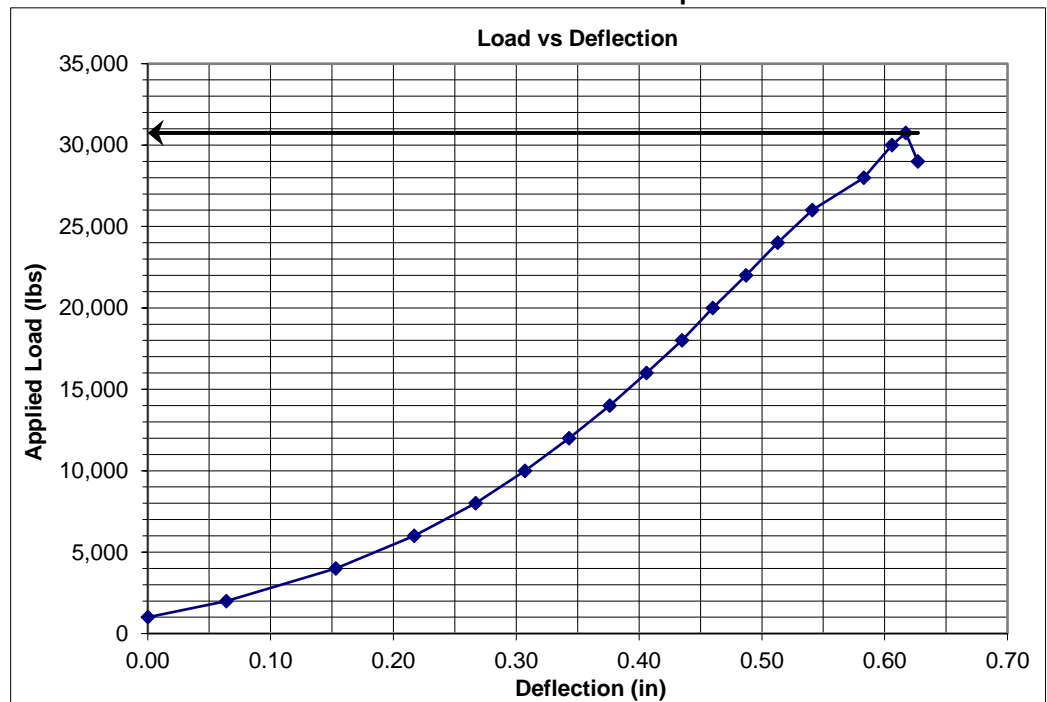
Specimen Number: T1  
 Product Type: Zenith Bracket  
 Applied Load Rate (in/min): 0.2



## Measurements

Load (lbs)	Defl. (in)
1,000	0.000
2,000	0.064
4,000	0.153
6,000	0.217
8,000	0.267
10,000	0.307
12,000	0.343
14,000	0.376
16,000	0.406
18,000	0.435
20,000	0.460
22,000	0.487
24,000	0.513
26,000	0.541
28,000	0.583
30,000	0.606
30,747	0.617

## Sample



Failure Mode: Concrete Failure  
 Yield Load,  $P_y$  (lbs)<sup>1</sup>: N.A.  
 Ultimate Load,  $P_u$  (lbs)<sup>2</sup>: 30,747  
 Allowable Strength (lbs)<sup>3</sup>: 15,374

$0.6 \cdot P_y$  (lbs) : N.A.  
 $0.5 \cdot P_{max}$  (lbs) : 15,374

## Notes:

1. Yield Load is approximately when the load-deflection curve is no longer linear.
2. Maximum recorded test load.
3. The load-deflection curve did not exhibit a well defined yield point. Therefore, the allowable strength was determined base on the maximum test load.

# ICF Hanger Pullout Tension Test



Client: RP Watkins, LLC  
 Job Number : FC09744.001  
 Date Tested : 10.14.2021  
 Technician: Ryan Beck

Load Device: UTM 400K  
 Load Frame ID: 2563114  
 Calibration Date: 05.26.2021

## Specimen Specification

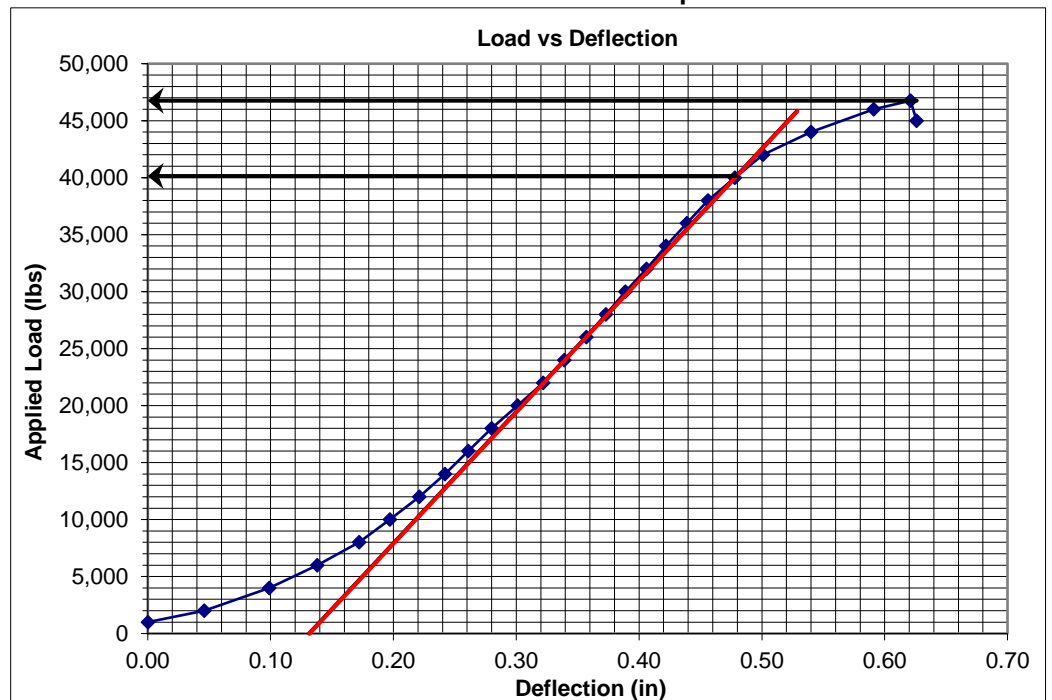
Specimen Number: T2  
 Product Type: Zenith Bracket  
 Applied Load Rate (in/min): 0.2



Sample

## Measurements

Load (lbs)	Defl. (in)
1,000	0.000
4,000	0.099
8,000	0.172
12,000	0.221
16,000	0.261
20,000	0.301
24,000	0.339
26,000	0.357
28,000	0.373
30,000	0.389
32,000	0.406
34,000	0.422
36,000	0.439
38,000	0.456
40,000	0.478
42,000	0.501
44,000	0.540
46,000	0.591
46,757	0.621
45,000	0.626



Failure Mode: Concrete Failure  
 Yield Load,  $P_y$  (lbs)<sup>1</sup>: 40,141  
 Ultimate Load,  $P_u$  (lbs)<sup>2</sup>: 46,757  
 Allowable Strength (lbs)<sup>3</sup>: 23,379

$0.6 \cdot P_y$  (lbs) : 24,085  
 $0.5 \cdot P_{max}$  (lbs) : 23,379

## Notes:

1. Yield Load is approximately when the load-deflection curve is no longer linear.
2. Maximum recorded test load.
3. Test results of  $0.6P_y$  (24,085 pounds) is larger than  $0.5P_{max}$  (23,379 pounds). The allowable strength is taken as the lower of the two values, or 23,379 pounds.

# ICF Hanger Pullout Tension Test



Client: RP Watkins, LLC  
 Job Number : FC09744.001  
 Date Tested : 10.14.2021  
 Technician: Ryan Beck

Load Device: UTM 400K  
 Load Frame ID: 2563114  
 Calibration Date: 05.26.2021

## Specimen Specification

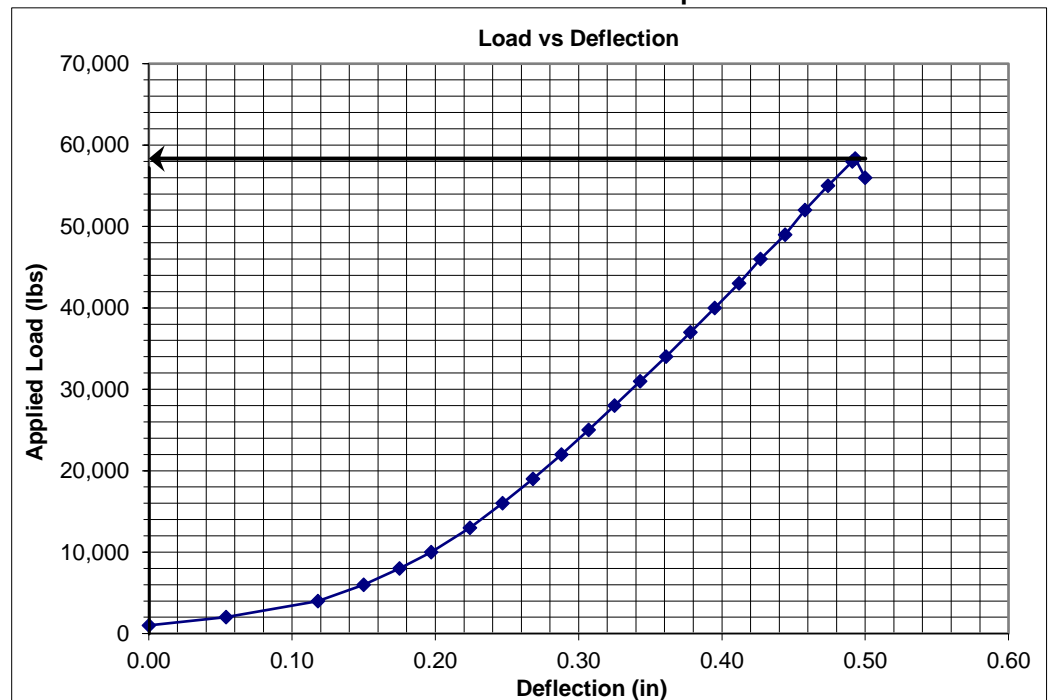
Specimen Number: T3  
 Product Type: Zenith Bracket  
 Applied Load Rate (in/min): 0.2



Sample

## Measurements

Load (lbs)	Defl. (in)
1,000	0.000
4,000	0.118
8,000	0.175
13,000	0.224
19,000	0.268
22,000	0.288
25,000	0.307
28,000	0.325
31,000	0.343
34,000	0.361
37,000	0.378
40,000	0.395
43,000	0.412
46,000	0.427
49,000	0.444
52,000	0.458
55,000	0.474
58,000	0.491
58,345	0.493
56,000	0.500

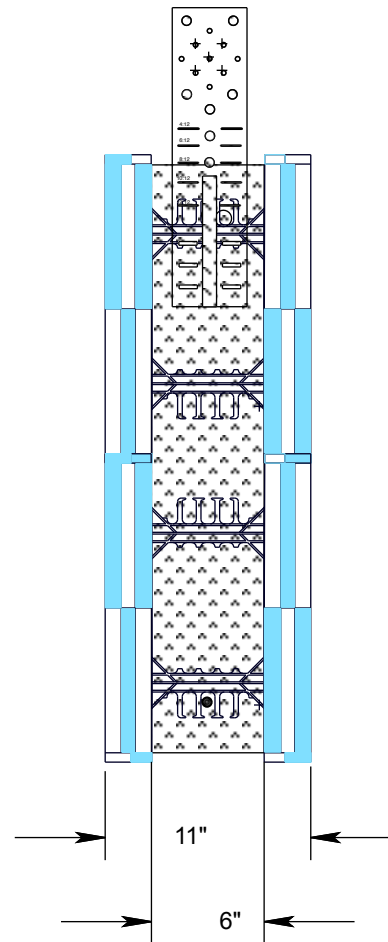
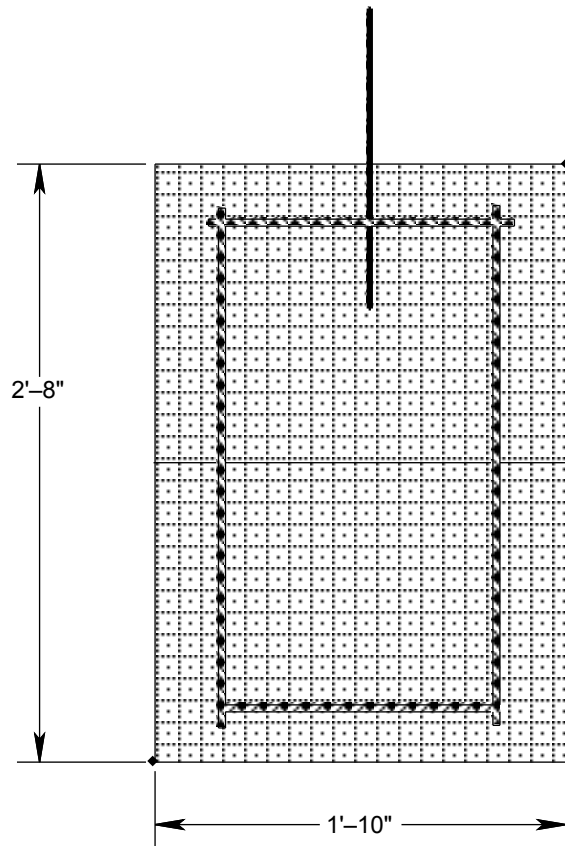


Failure Mode: Concrete Failure  
 Yield Load,  $P_y$  (lbs)<sup>1</sup>: N.A.  
 Ultimate Load,  $P_u$  (lbs)<sup>2</sup>: 58,345  
 Allowable Strength (lbs)<sup>3</sup>: 29,173

$0.6 \cdot P_y$  (lbs) : N.A.  
 $0.5 \cdot P_{max}$  (lbs) : 29,173

## Notes:

1. Yield Load is approximately when the load-deflection curve is no longer linear.
2. Maximum recorded test load.
3. The load-deflection curve did not exhibit a well defined yield point. Therefore, the allowable strength was determined base on the maximum test load.



2500 PSI concrete  
#3 rebar in sample

1

General Notes

Zenith Brace Pullout Test Sample Detail

No.	Revision/Issue	Date

Firm Name and Address  
**RP Watkins LLC**  
 405-664-0010  
[www.growmichiganbuildings.com](http://www.growmichiganbuildings.com)

Project Name and Address

Project Date Scale	Sheet
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